

## Heart Rate Monitor

In the mid-1970s, NASA saw a need for a new type of sensing electrode for monitoring the heart action of astronauts over long periods of time. The widely-used conducting electrode, which makes contact with the skin through a paste electrolyte, is generally satisfactory for acquiring electrocardiographic data in normal use by hospitals or physicians, but for long duration use it has disadvantages—for example, the paste may dry, causing unacceptable distortions of the data sensed. Other electrodes make direct contact with the skin without use of a paste electrolyte. They, too, pose problems for long use in space, principally the “motion artifact,” wherein movement of the subject causes movement of the electrode’s contact and induces signal-distorting noise.

Accordingly, NASA initiated development—through a grant to Drs. Robert M. David and William M. Portnoy of Texas Technical University, Lubbock, Texas—of an advanced electrocardiographic electrode suitable for long term astronaut use. The Texas Tech team responded with an insulated capacitive electrode constructed of a thin dielectric film applied to a stainless steel surface. The electrode functions immediately on contact with the skin and is not affected by ambient conditions of heat, cold, or light, nor by perspiration, dry, rough or oily skin conditions; the insulative film prevents motion artifact. NASA was assigned the patent to the invention and subsequently NASA awarded a license for use of the technology to California entrepreneur Richard D. Charnitski. Charnitski founded Heart Rate Inc. (HRI), Costa Mesa, California to continue development and to produce heart rate monitors and exercise machines for the physical fitness industry and medical markets. At

lower left, a heart rate monitor is being assembled by a HRI technician.

HRI has completed prototype demonstrations for three products—a heart rate wrist watch, a chest strap mounted monitor and an aerobic machine controlled with heart rate. The sensors have also been tested and proven to meet the American Heart Association’s specifications for electrocardiographic electrodes. HRI is discussing manufacture and marketing of these devices with other companies. One company—Lifecycle, Inc., Irvine, California—is marketing the HRI device as the Lifecycle™ Aerobic Monitor for use by health clubs and sports organizations to assure that a user’s heart rate during exercise is within proper limits; the user simply presses his thumbs to two sensors to get an instant digital heart rate reading. The unit can be wall-mounted for use before or after exercise, or it can be affixed to exercise equipment such as the Lifecycle Aerobic Trainer (below center), a programmable hill pedaling device with an electronic display that shows such factors as pedaling speed, calorie expenditure rate and exercise time. In such an installation, the HRI heart monitor can be a separate unit or the circuitry can be added to the existing electronic system, with the heart sensors activated by hand contact with the handlebar grips.

HRI is also marketing a monitor called 1.2.3, Heart Rate™ with a product of its own manufacture, the Versa-Climber™ (below right), a vertical stepping exerciser designed to use all the major skeletal muscle groups for aerobic conditioning and strength training. The Versa-Climber has a microcomputer and a digital display showing exercise time, climbing rate and step rate.

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™1.2.3 Heart Rate and Versa-Climber are trademarks of Heart Rate Inc.

